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A PERCEPTION OF THE EFFECTIVENESS OF THE ACQUISITION LOGISTICS ALGORITHM IN MEASURING PROGRAM STATUS

THESIS

James R. Miller
GS-12, AFLC

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THESIS

Presented to the faculty of the School of Systems and Logistics of the Air Force Institute of Technology
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James R. Miller
GS-12, AFLC

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James R. Miller

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Abstract

This ~~study~~ thesis analyzed the perceptions that AFLC and AFSC logisticians have of the current algorithm used to assess the logistics status of acquisition programs. The study also determined the weights that should be applied to the different ~~ILS~~ Integrated Logistics Support (ILS) elements in order to effectively measure the logistics status of an acquisition program.

Recommendations were made to (1) change the weight assigned to the ILS elements based on program phase; (2) eliminate the Air Force Precedence score from the algorithm; (3) eliminate the program score from the algorithm.

Recommendations for future research were to (1) review the issue of life cycle cost; (2) conduct a regression analysis on the algorithm to determine its effectiveness; and (3) develop a method to control the evaluator subjectivity. (KP)

A PERCEPTION OF THE EFFECTIVENESS OF THE ACQUISITION LOGISTICS ALGORITHM IN MEASURING PROGRAM STATUS

I. Introduction

Background

Acquisition logistics is a management process which consists of the identification, assessment, analysis, and the resolution of logistics activities during the weapon system acquisition process (5:2). To assist the program manager in determining if he is meeting these objectives the Air Force Acquisition Logistics Center (AFALC) utilizes a management information system (16).

Prior to implementing the management information system, many Deputy Program Managers for Logistics (DPML) expressed a concern that they were not able to adequately perform their prime mission of ensuring logistics supportability for acquisition programs because they were constantly receiving requests for information on the logistics status of the program (18;25). The purpose of the management information system was to reduce the status reporting workload by maintaining a computer based system that had the latest status of any given acquisition program. This reduction in status reporting was intended to enable the DPML to have more time to devote to working logistics supportability issues (25).

Research Issue

The Air Force Acquisition Logistics Center maintains data on all Air Force acquisition programs. AFALCR 800-2 tasks the Deputy Program Manager for Logistics (DPML) to update the status of the ten Integrated Logistics Support (ILS) elements in the Acquisition Logistics Management Information System (ALMIS) every 30 days and whenever a significant program event has occurred (1:1). The ILS elements are rated Red, Yellow, or Green. A rating of Green means either an adequate get well plan is available or the program is on schedule. A rating of Yellow is given if there is a questionable get well plan or a possible schedule slippage. A rating of Red indicates an inadequate get well plan, a schedule slippage, or a significant logistics supportability impact (14). Every month the programs are rank ordered to determine which programs most need additional management attention. This is accomplished by running the sub program "Score-Rank". In the "Score-Rank" program a numeric weight is assigned to each ILS element based on the color code. The program algorithm then determines the rank-order of the programs (13). In 1986 the number of ILS elements were reduced from fifteen to ten but the algorithm wasn't changed. Therefore, the AFALC wants to determine if the algorithm they are using to measure logistics status is perceived by the logistics community to be effective in identifying problem programs (3).

Statement of the Problem. This research will measure the perceptions that logisticians have of the effectiveness of the current method of evaluating logistics program status and to determine what algorithm should be used to measure the logistics status of a program.

Specific Objective

The objective of this research was to gather data from a random sample of Air Force officers and Department of the Air Force civilians assigned to logistics activities of AFLC and AFSC in order to determine the perception of the current method of rank ordering acquisition programs and to determine if different weights for the ILS elements should be used. To assist in this effort the following specific objectives were established:

1. Determine to what extent the Air Force acquisition logistics community perceives the current algorithm to be effective in measuring the status of acquisition programs.

2. Determine what weights should be assigned in the algorithm to more effectively measure the status of acquisition programs.

Investigative Questions

The specific objectives will be met by analyzing the answers to the following investigative questions:

1. How do logisticians perceive the phases of the acquisition process should be weighted?

2. How do logisticians perceive the ILS elements should be rank-ordered?

3. What is the perceived relationship between the weights for ILS elements in one phase compared to the other phases?

4. Do acquisition logisticians perceive that the weights for the ILS elements are program independent?

Scope of the Study

This research measured the perceptions that logisticians have of the effectiveness of the current method of evaluating logistics program status and assisted in determining what weights should be used for the ILS elements to measure the logistics status of acquisition programs. The collected data was analyzed to determine if acquisition logisticians have a different perception of the effectiveness of the current algorithm than support logisticians and to determine the weights to be used for the ILS elements in the algorithm for the different phases of the acquisition process. The collected data was analyzed to determine any relationships between support and acquisition logisticians based on end item management orientation and the phase of the acquisition process.

Definition of Terms

System Program Manager. Every Air Force acquisition program has a program manager assigned in the system program office. The purpose of the program manager is to provide

the Air Force with a single focal point for the acquisition program. It is the responsibility of the program manager to represent and protect the interests of the Air Force in all matters pertaining to the acquisition program (2:2;16:2). To assist the system program manager in the performance of his duties and responsibilities, functional area specialists are also assigned to the weapon system program office.

Deputy Program Manager for Logistics (DPML). The DPML has the responsibility to ensure that logistics considerations are included during the design phases of the acquisition process. The DPML ensures that the logistics issues which impact supportability, performance, and schedule are considered up front in order to reduce the life cycle costs associated with the system.

Integrated Logistics Support (ILS). The purpose of the integrated logistics support (ILS) program is to integrate and correlate the technical and management issues and activities associated with an acquisition program (5:1). The integrated logistics support elements form the major planning components of the weapon system to achieve the required support capability at an affordable life cycle cost (5:1-2;6:2). Based on the status of the ILS elements each acquisition program is assigned a specific ranking.

Acquisition Logistics Management Information System (ALMIS). The Air Force Acquisition Logistics Center is tasked with the responsibility of ensuring that the weapon systems acquired by the Air Force will be fully supportable

and able to perform the mission they were designed for in a cost effective manner. Each program manager assesses his program on a monthly basis and inputs the resulting data in the Acquisition Logistics Management Information System data base. Based on the data in ALMIS, each program is given a rank score indicating the logistics status of the program (13:44-46).

ALMIS is the management information system that is used by the Air Force Acquisition Logistics Center to maintain information on the status of Air Force acquisition programs. The purpose of ALMIS is to increase the effectiveness of acquisition logistics managers by identifying logistics problem areas in a timely manner. The data base is also designed to reduce the logistics status reporting workload associated with an acquisition program.

Organization of the Thesis

The organization of the thesis will follow the model outlined in the AFIT Style Guide for Theses and Dissertations (24).

Chapter I of the thesis is an introduction to the research issue. It contains a background of the problem, the research issue including the statement of the problem, the objectives of the research, the investigative questions, the scope of the study, a definition of terms, and the organization of the thesis.

A review of the pertinent literature is in chapter II. This chapter examines the current and previous methods used

to evaluate acquisition logistics program status and their associated degree of success.

Chapter III contains the methodology used in gathering and analyzing the data. It also provides information relative to the population of interest and the sampling technique that was used.

Answers to the investigative questions are in chapter IV of the thesis. It also contains the analysis of the data and reports the findings.

Chapter V provides a summary of the study and recommendations for the direction that further research should take.

II. Literature Review

Definitions and Relationships

The DPML ensures that the logistics issues which will impact supportability, performance, and schedule are properly considered on the front end of the system acquisition process in order to reduce the life cycle costs associated with the system. The program manager is responsible to provide the leadership for logistics planning. This function is achieved by establishing and implementing a logistics management concept that is responsive to the supportability and readiness objectives of the weapon system (10;16:2).

The program manager is assigned to the weapon system acquisition program office by the implementing command. The implementing command is usually the Air Force Systems Command (AFSC), although the responsibility for implementation may be assigned to a different organization for a command peculiar acquisition program where educational or technological expertise is a prerequisite for the successful completion of the acquisition. An example of such a program would be an upgrade of the military telephone switching system for the Eastern United States by using satellites. In this example, the program manager would probably be assigned to the Air Force Space Command (USSPACECOM) because of the technology involved with space systems.

In order to assist the program manager in the performance of his duties and responsibilities, functional area specialists are also assigned to the weapon system program office. There is no set number of functional area specialists assigned to a program office; but, as a minimum, each program office has a functional expert assigned for contracting, engineering, and logistics (16:7).

The functional area specialist assigned to the program office, who is tasked with the responsibility to ensure that logistics considerations are included during the design phases of the acquisition process, is the Deputy Program Manager for Logistics (DPML). The DPML is tasked with ensuring that the weapon systems, and the related equipment, acquired by the Air Force will be fully supportable and able to perform the mission they were designed for in a cost effective manner.

The DPML is assigned to the system program office by the Air Force Acquisition Logistics Center (AFALC) (4:1-2). This is usually accomplished at the beginning of the Concept Exploration Phase shortly after the milestone 0 decision. The DPML is the person who is tasked with the responsibility to ensure that all the logistics issues and considerations are identified and included during the design phases of the acquisition process. This responsibility extends to the logistics functions for the weapon system and its related equipment. It includes the ten Integrated Logistics Support (ILS) elements, the logistics budgeting process, and all

facets of the support structure for the complete system including all of the related support equipment (16:2).

Although the weapon system program manager has the overall responsibility to establish and implement the ILS program within the system program office, the DPML is usually assigned the management responsibility for it by the program manager. The DPML, under the direction of the system program manager, integrates the ILS elements with the design considerations of the system. He is also responsible for developing the contracting and planning documents required for the system acquisition.

Integrated Logistics Support (ILS). Integrated logistics support (ILS) is implemented within the Air Force by means of AFR 800-8, Integrated Logistics Support (ILS) Program (5:1). This regulation defines the Air Force program of integrated logistics support as required by DODD 5000.39. The purpose of the Air Force's integrated logistics support program is to integrate and correlate all of the technical and management issues and activities associated with a weapon system acquisition program (7:1).

The Air Forces's integrated logistics support program is used to accomplish the following objectives:

1. Integrate support considerations into the design objectives for the system and the related equipment.

2. Increase sustainability by relating the support requirements to readiness objectives, to the system design, and to each other.

3. Acquire the support needed for the system.

4. Provide required support for the system during the operational phase consistent with the life cycle cost objectives (7;27).

The following ten Integrated Logistics Support elements are identified in DODD 5000.39 and are specifically addressed in the ILSP (7:2). The integrated logistics support elements serve to form the major planning components of the weapon system to achieve the required support capability.

1. Maintenance Planning.
2. Manpower and Personnel.
3. Supply Support.
4. Support Equipment.
5. Technical Data.
6. Training and Training Support.
7. Computer Resources Support.
8. Facilities.
9. Packaging, Handling, Storage, and Transportation.
10. Design Interface.

Each element is interrelated and interdependent with one or more of the other elements as well as the weapon systems design. The integration of each element with other elements and the weapon system design is achieved through the LSA process (MIL-STD-1388-1A and MIL-STD-1388-2A) and by preparing subordinate ILS elements plans. These plans

prescribe specific objectives, strategies, and requirements for each element in relationship to other elements, the weapon system, and support equipment (5:1-2;7:2).

Maintenance Planning. The ILS element of maintenance planning describes the maintenance concept that is required to meet design and readiness objectives for the weapon system and the weapon system related equipment. The maintenance concept drives the facilities and manpower requirements necessary to maintain the weapon system and the weapon system related equipment.

In the long run, maintenance planning is one of the most significant factors that influences the life cycle costs of the weapon system. Therefore it is necessary to strike a balance between maintainability and life cycle costs (2:31-1 to 31-2).

Manpower and Personnel. The ILS element of manpower and personnel is concerned with identifying the proper personnel requirements, with the correct skills and training levels that are required to support the weapon system and the weapon system related equipment (2:29-1 to 29-3).

Supply Support. The integrated logistics support element of supply support consists of the management activities which are associated with determining and acquiring the spares, both initial and replenishment, for the weapon system and the weapon system related requirements (2:40-1 to 40-2;11).

Support Equipment. The integrated logistics support element of support equipment is concerned with identifying and acquiring all the equipment needed to support the operation and maintenance of the weapon system. This includes the ground handling and maintenance equipment, test equipment, and automatic test equipment (21).

Technical Data. The integrated logistics support element of technical data is concerned with the identification and acquisition of technical orders and engineering data. Technical data is all of the information of a technical or engineering nature that is needed to convert the weapon system design specifications into logistics supportability considerations (2:38-1 to 38:;5;19).

Training and Training Support. The integrated logistics support element of training and training support is concerned with the identification of the training requirements needed to support the weapon system and the weapon system related equipment. In addition to identifying the required training it also identifies and acquires training equipment and devices. It is necessary to train personnel to operate and maintain the weapon system in order to be able to utilize it. This training consists of equipment training, formal training, and on-the-job training (2:39-1 to 39-4).

Computer Resources Support. The integrated logistics support element of computer resources support is

concerned with the identification and acquisition of computer hardware, software, firmware, and associated computer documentation required to operate and support the weapon system and the weapon system related equipment. It is also concerned with the identification of the technical manpower required to support the computer systems (2:43-2).

Facilities. Facilities are real property assets required to support the weapon system consistent with the operational and readiness requirements. The facilities integrated logistics support element ensures that the required facilities are available to the using and supporting commands to provide integration with the weapon system support structure.

The integrated logistics support element of facilities is concerned with the identification and acquisition of real property required to support the weapon system and the weapon system related equipment. It includes modifications to currently existing facilities as well as the construction of new facilities required to support the weapon system (22).

Packaging, Handling, Storage, and Transportation. The integrated logistics support element of packaging, handling, storage, and transportation is concerned with the identification of the requirements, procedures, and methodologies needed to ensure that the weapon system and the weapon system related equipment are transportable consistent with mission objectives. This element includes

storage, transportation, and packaging requirements for the system and the system related equipment (20).

Design Interface. The integrated logistics support element of design interface correlates the other integrated logistics support elements into the design and cost objectives for the weapon system and the weapon system related equipment. This is accomplished by relating the system objectives with the logistics readiness objectives. Design interface is the element that reviews the design objectives, relative to logistics, to ensure logistics requirements are integrated into the weapon system and the weapon system related equipment.

The design interface integrated logistics support element helps to ensure that the technical performance of the weapon system is balanced with the other integrated logistics support elements and with the economic objectives and constraints of the acquisition program (2:30-1).

Acquisition Phases. The acquisition logistics management of any Air Force weapon system program is dictated by DODD 5000.1. This directive outlines the processes and procedures that govern the acquisition of any new weapon system (9:1). The phases in the acquisition process are as follows:

Preconceptual Phase. In the preconceptual phase the Statement of Operational Need (SON) is developed. The SON defines in operational terms the specific requirement or deficiency.

Concept Exploration Phase. This phase is concerned with the identification of solutions for the deficiencies cited in the SON. During this phase, cost, schedule, support parameters, and performance parameters are reviewed and integrated.

Demonstration/Validation Phase. The purpose of this phase is to select a system development approach and identify the risks associated with the program.

Full Scale Development Phase. In the full scale development phase the complete system is developed and tested in preparation for production.

Production/Deployment Phase. The purpose of this phase is to produce and deploy the complete system (9;15).

After the military planners and policy leaders have identified the existing military threats and implemented the recommended counter strategies, the need for a new weapon system may be identified. If the acquisition of a weapon system is required to counter the threat, the Air Force begins the five phase acquisition process involved in the acquisition of a weapon system (25).

Supportability. If the weapon system acquisition program is to be successful it is necessary that the logistics planning be timely. The system program manager and the DPML must start planning for logistics supportability from the start of the program and ensure that the planning activities remain current throughout all of the phases of the acquisition process (8:1).

The formal planning process begins with the inception of the Program Management Plan (PMP) during the concept exploration phase. The program manager and the DPML's involvement in planning for logistics considerations must continue throughout the acquisition or until the management of the weapon system is turned over to the supporting command at program management responsibility transfer (PMRT). The program management plan outlines and details the support that is required from the using command, supporting command, implementing command, and any other interested organizations. The deputy program manager for logistics, under the direction of the weapon system program manager, develops the program management plan based on the acquisition strategy (4:1).

Section 9 of the program management plan is the Integrated Logistics Support Plan (ILSP). It is a government working document that pertains to the logistics elements that the government has not contracted out. The purpose of the ILSP is to determine:

1. What specifically has to be accomplished.
2. Who is responsible to ensure that it is accomplished.
3. What the schedule needs to be (5).

The integrated logistics support plan contains three main parts.

Part one of the ILSP is a general part that provides an outline of the system description and program objectives.

Part two of the ILSP contains the concepts and strategies that will be followed for the system. In addition to containing the acquisition strategy, it also contains the maintenance, operational, and testing concepts.

Part Three of the ILSP contains the milestone schedule and resource reports. The ILSP will of necessity be somewhat vague and general in nature during the concept exploration phase; however, as the weapon system advances the ILSP will define the specific actions required for each of the ILS elements to ensure they are integrated with the weapon system support requirements (16:4).

Contractual Issues. The logistics requirements to be performed by contractors must be described in full detail in the Request For Proposal (RFP) and must be incorporated into the Statement of Work (SOW) and the Contract Data Requirements List (CDRL) (27:160-166). Part of this logistics requirement is to task the contractor to submit his Integrated Support Plan (ESP). The contractor's ISP explains the approach the contractor plans to take to ensure the logistics issues and operational support requirements are compatible. The ISP will serve as a method of measuring the contractor's logistics performance. The contractor's ISP must correlate with the government's ILSP. After the contractor's document is approved by the government it will become part of the contract.

The ISP format must be the same as the government's ILSP in order for the program office to determine if the

contractor is performing as he should relative to the contractual logistics issues.

Prior Studies

In the Fall of 1987, AFSC/PL was concerned with the ratings that were being assigned to the individual integrated logistics support elements. This concern centered around the method that was used to measure the status of the individual ILS elements. The evaluation method consisted of assigning a numeric value between 0 and 9 to each ILS element. Based on the numeric value assigned, a color code for the element was established. If the numeric value was 0 the color code of Green was assigned. A rating of 1 through 5 indicated a rating of Yellow. A color coding of Red was assigned to any element with a numeric value higher than 5. A rating of Green meant the ILS element had an adequate get well plan and was on schedule. A rating of Yellow was given if there was a questionable get well plan or a possible schedule slippage. A rating of Red indicated an inadequate get well plan, a schedule slippage, or that there was a significant logistics supportability impact (14). The system then in use was a subjective evaluation on the part of the program office that created a discontinuity of the ratings for the ILS elements from program office to program office. Because the color coding of the individual ILS elements was a major portion of the ILS assessment it was important to develop a method of resolving this discontinuity. In an attempt to provide some

structure to the rating of the individual ILS elements a policy letter was distributed by AFSC/PL to each of the program offices in early 1988 outlining the criteria to be used in the assessment of the individual ILS elements.

The guidance that was provided to the program offices centered around what color code should be applied to a specific ILS element based on the severity of the problems associated with the element. Basically the criteria was as follows:

A color coding of Green should be applied to an ILS element that has no problems or only minor problems that have solutions readily available.

A color coding of Yellow should be applied to an ILS element that has minor to severe problems, but has potential solutions readily available.

A color coding of Red should be applied to an ILS element that has serious or potentially serious problems that require higher headquarters assistance to resolve.

Ms Ruth Klumb of the AFALC Directorate of Systems Support, conducted a study in June 1987, on the relative importance of the individual ILS elements grouped by system acquisition phase. Twenty-eight DPMLs from the various product divisions were surveyed to determine their views concerning ILS element importance by phase. The study indicated that there may be a difference in the importance of the ILS elements in the different Acquisition phases but, these differences were not measured (11;14).

In 1979 AFALD/XRS was tasked to determine how to measure the logistics status of Air Force acquisition programs. The algorithm they developed is used in ALMIS to assist in the determination of the status of an acquisition program. The algorithm is as follows:

1. ILS element score:

Green = 0

Yellow = 1 to 5

Red = 6 to 9

The weight of 20 times the color coding weight for the specific ILS element equals the individual element score. The sum of the scores equals the weight assigned for the ILS elements.

2. Air Force Precedence score:

The precedence score equals the number 80, divided by the quantity, 1.5 times the Force Activity Designator (FAD), times one third the Urgency of Need designator (UND).

3. Program Phase score:

Weights for the acquisition phases are as follows:

Production Deployment Phase	50
Full Scale Development Phase	25
Demonstration/Validation Phase	25
Concept Exploration Phase	10

The total program score is arrived at by summing the ILS Element score, the Air Force Precedence score, and the Program Phase score (11;14). As an example, if a program had one ILS element rated Red 6, two elements rated as

Yellow 3, and the rest were rated as Green, it would have an ILS score as follows:

1 X 6 X 20 =	120
2 X 3 X 20 =	120
7 X 0 X 20 =	0
	240

If the FAD were a 2 and the UND were a 6 it would have a precedence score of 13.

$$\frac{80}{(3/2 \times 2)(1/3 \times 6)}$$

If the program were in the FSD phase it would have a program phase score of 25.

The total score for the program would be as follows:

ILS Score	240
Precedence Score	13
Program Phase Score	25
Total Score	278

III. Methodology

Overview

This chapter describes the procedures used to answer the investigative questions. These questions were as follows:

1. How do logisticians perceive the phases of the acquisition process should be weighted?

2. How do logisticians perceive the ILS elements should be rank-ordered?

3. What is the perceived relationship between the weights for ILS elements in one phase compared to the other phases?

4. Do acquisition logisticians perceive that the weights for the ILS elements are program independent?

Population

The population of interest for this study was Air Force officers and civilians working as acquisition logisticians assigned to either the Air Force Acquisition Logistics Center or the AFSC product division program offices, and their functional counterparts assigned to the Air Force Logistics Command (AFLC) Air Logistics Centers as support logisticians. Based on AFLC manpower figures there are 361 civilians and 164 Air Force officers currently assigned to these organizations with the job series and grades that meet the population of interest.

Sample

Using a stratified random sample based on current program assignment, data was collected to determine if acquisition logisticians have a different perception of the effectiveness of the current algorithm than support logisticians. The data was also used to determine to what extent the current algorithm is perceived to be effective in measuring logistics program status.

A survey was mailed to 252 acquisition logisticians assigned to AFALC but matrixed to the Air Force Systems Command's (AFSC) product divisions. The survey was also mailed to 120 support logisticians assigned to the AFLC Air Logistics Centers. These organizations were chosen because their item management orientation is similar to the item management orientation of the AFSC product divisions. The names and addresses for the respondents were provided by the Air Force Acquisition Logistics Center through the ALMIS data base. It was assumed that the logistics users of the ALMIS data base would be the most knowledgeable of the requirements needed to assess the status of acquisition programs.

Survey Instrument

A mailed survey was developed and approved by the Air Force Military Personnel Center (AFMPC), to collect information from a sample of logisticians. This approach was used because of the constraints of both time and money. This approach also permitted a larger sample size to be

surveyed. The most significant problem associated with using a mailed survey is the return rate of the survey to obtain a representative sample. Therefore, some of the techniques that Dillman has suggested to increase the response rate were used. (12:171-176). The cover letter for the survey addressed not only the need for the respondent's help, but also addressed the support the AFALC commander had for the research. The logisticians were given ten working days from the date of mailing to answer and return the survey in the postage paid, pre-addressed envelope. Five working days after the survey was mailed a follow up letter was sent thanking those who responded and requesting the others to complete and return the survey. The survey, (see appendix A), contained demographic questions, subject matter perception questions, and structured open ended questions designed to elicit data concerning the relative value of the ILS elements in the different phases of the acquisition process. Question number 1 through question number 6 were used to gather demographic data to classify the respondents. These questions were multiple choice questions.

Question number 7 through question number 22 were designed to elicit information concerning the perceptions that logisticians have of the current algorithm and of the weights that are currently being used. Questions number 23 and 24 were used to determine the perceptions that logisticians have of the purpose of the management information system. A seven point Likert scale was used to

gather information from the respondents concerning their perception of the usefulness of the current algorithm that the AFALC uses to determine the status of their acquisition programs.

Question number 25 through question number 29 were structured open ended questions requiring the respondents to assign weights to the different ILS elements in the different phases of the acquisition process. They were used to gather information concerning the relative value of the different ILS elements and phases to the acquisition process.

Survey Pretest

The survey instrument was pre-tested using logistics management specialists assigned to AFALC/LS and also logistics management specialists who had just completed the Deputy Program for Management Logistics (AFALC 001) course conducted by the AFALC. The purpose of the pre-test was to determine the amount of time required to complete the survey, to evaluate the readability of the instrument, to improve the instrument, and to check the content validity of the survey instrument. Based on the feedback from the pretest, fifteen question concerning the ALMIS data base and its purpose were removed from the survey. In the place of these questions, two questions were asked about the role that the ALMIS data base should play in the assessment of acquisition programs.

Analysis Methodology

Questions 1 through 6 of the survey were multiple choice questions. They were used to gather and analyze the demographic data that was used to classify the respondents. For these questions, a frequency count for each category was used. The results of this analysis are in chapter IV.

A Chi Square test of independence was conducted on question number 7 through 24 to determine any significant differences between the categories based on program orientation for acquisition logisticians and support logisticians. The mode and the median were also computed for each program orientation for both acquisition logisticians and support logisticians. The mode is the measurement that occurs with the greatest frequency in the data set (26:58). The median of a data set is a number such that half the measurements fall below the median and half fall above (26:64). The mode was used to show how strongly the respondents feel about the specific issues whereas the median was used to provide a rank order of the respondents. The results of this analysis are in chapter IV.

The information from question number 25 through question number 28 was analyzed by using a 2x5 factorial design in order to determine if there was any significant difference at the .01 alpha level between the weights assigned for the different ILS elements by acquisition logisticians and support logisticians, based on program orientation and the phase of the acquisition process. A

factorial design is a method for selecting the treatments or the factor levels to be included in an experiment. A complete factorial design is one in which observations are made for every combination of factors. In order to conduct an analysis of variance it is necessary to assume that the population variances are equal (26:701-702). In this study the factors that were of value were the end item management orientation of the respondent and whether the respondent was a support logistician or an acquisition logistician. Because the shape of the population probability distribution was unknown a nonparametric test was used to analyze any differences between the rank order of the ILS elements. No assumptions concerning the variance of the sample are required for the nonparametric counterpart to the analysis of variance, the Friedman Fr test (28:139-146). When using the Friedman Fr Test for a randomized block design certain assumptions are made. They are as follows:

1. The treatments are randomly assigned to an experimental unit within the blocks.

2. The measurements can be ranked within blocks.

3. Either the number of blocks or the number of treatments should exceed five for the approximation to be adequate (23;26:763).

Using the ILS elements and the five end item management orientations, these assumptions were adhered to for this study. To assist in solving the investigative questions, respondents with at least 24 months of logistics experience

were used as a panel of experts. The 24 month level was chosen based on pretest scores for the Deputy Program Manager for Logistics course. Pretest scores indicated that logisticians with at least 24 months of experience generally scored at least one standard deviation above the mean. Although there have been no formal studies to explain why logisticians with at least 24 months of experience score higher, it is assumed that knowledge of the ILS elements is the reason (18).

A computer program was built to conduct a 2x5 analysis of variance on the responses to question number 25 through question number 28 for the experts. A Friedman Fr test for a randomized block design was also used. The results of this analysis are in chapter IV.

The information from question number 29 was analyzed by using a 2x5 factorial design in order to determine if there was any significant difference, at the .01 alpha level, between the weights assigned for the different phases of the acquisition process by acquisition logisticians and support logisticians, based on program orientation. A Friedman Fr test for a randomized block design was also used to analyze the data at the .01 alpha level in order to determine any differences in the rank order of the phases. The results of this analysis are in chapter IV.

IV. Findings and Analysis

Introduction

The purpose of this study was to examine the perceptions that logisticians have of the effectiveness of the current algorithm used by AFALC and to determine what weights should be applied to the individual ILS elements in the various phases of the system acquisition process in order to improve the algorithm. This chapter presents a summary of the survey responses and an analysis of the collected data. It also addresses the four investigative questions outlined in the first chapter based on an analysis of the information provided by the respondents.

The chapter is divided into five main parts: (a) sample response summary; (b) presentation of the demographic data; (c) a perception of the usefulness of ILS elements in the current algorithm; (d) the relative value of the different ILS elements during the different acquisition phases and the relative value of the different acquisition phases to the acquisition process; and (e) a summary of the results for the investigative questions.

Sample Response Summary

The sample consisted of 71 Air Force officers from 2nd Lieutant (01) to Colonel (06) with a duty AFSC of 66XX or 64XX and 122 civilians from GS-11 to GM-15 assigned to logistics activities within the AFSC product divisions, AFLC Air Logistics Centers, or AFALC. Of the 372 surveys mailed,

11 were returned because the people had changed organizations. Seven of the surveys were returned with notes indicating that the respondent did not have sufficient knowledge to complete the survey. This reduced the sample size to 354. Of the 354 remaining surveys, 234 were returned by the indicated return date. However, 16 of the surveys were not returned until after the data base was built. Of the remaining surveys 25 were not usable because of being incorrectly filled out. This represents a response rate of 64 percent. The Air Force Manpower and Personnel Center (AFMPC) reports response rates around 60 percent for Air Force surveys (23). Based on this, the response rate for this survey was considered satisfactory.

The survey contained demographic questions, ILS perception questions, and ILS weight questions. A copy of the survey is in Appendix A.

Demographic Data

The demographic data was used to group the respondents as either being an acquisition logistician or as being a support logistician. The data was also used to group the respondents into one of the following five end item management orientations:

1. Aircraft Systems
2. Electronic Systems
3. Missile Systems
4. Munition Systems
5. Space Systems

Question number 1 through question number 6 were used to gather demographic data to classify the respondents. These questions required the respondents to choose a multiple choice response.

The first section of the survey dealt with demographic questions. The results for the number of respondents based on program orientation are in Table 1.

TABLE 1

RESPONDENTS BASED ON PROGRAM ORIENTATION

ACQUISITION	MILITARY	CIVILIAN	TOTAL
AIRCRAFT SYSTEMS	23	37	60
ELECTRONIC SYSTEMS	17	15	32
MISSILE SYSTEMS	4	9	13
MUNITION SYSTEMS	4	8	12
SPACE BASED SYSTEMS	2	10	12
	20	79	129

SUPPORT	MILITARY	CIVILIAN	TOTAL
AIRCRAFT SYSTEMS	5	15	20
ELECTRONIC SYSTEMS	6	10	16
MISSILE SYSTEMS	3	5	8
MUNITION SYSTEMS	3	9	12
SPACE BASED SYSTEMS	4	4	8
	21	43	64

Table 2 depicts the length of time worked in logistics by end item management orientation for both acquisition logisticians and support logisticians.

TABLE 2

TOTAL TIME WORKED IN LOGISTICS

ACQUISITION	0-12 MO	12-24 MO	24-36 MO	OVER 36 MO
AIRCRAFT SYSTEM	4	18	9	29
ELECTRONIC SYSTEM	4	14	2	12
MISSILE SYSTEM	0	3	4	6
MUNITION SYSTEM	1	2	4	5
SPACE BASED SYSTEMS	0	3	1	8
	9	40	20	60

SUPPORT	0-12 MO	12-24 MO	24-36 MO	OVER 36 MO
AIRCRAFT SYSTEMS	3	2	6	9
ELECTRONIC SYSTEMS	3	0	7	6
MISSILE SYSTEMS	1	0	4	3
MUNITION SYSTEMS	3	3	1	5
SPACE BASED SYSTEMS	1	1	2	4
	11	6	20	27

ILS Perception Data

Question number 7 through question number 24 required the respondents to answer using a seven point Likert scale. Table 3 depicts the name assigned to each numeric value for the Likert scale.

TABLE 3

LIKERT SCALE VALUES

7 = Strongly Agree

6 = Moderately Agree

5 = Agree

4 = Neither Agree Nor Disagree

3 = Disagree

2 = Moderately Disagree

1 = Strongly Disagree

For these questions the mode and median are of the most value in determining the perception of the respondents. The answers to these questions were expressed in terms of frequencies of response. The data was measured in terms of the number of individuals who were in each of the different categories. In order to determine if the frequencies of the different categories differ from what could be attributed to chance, a Chi square analysis was used. The Chi Square test was used to determine any significant difference for support logisticians and acquisition logisticians. The Chi Square test was also used to determine if there was any significant difference between the respondents based on end item management orientation.

The data was analyzed by using the basic programming language and the VP Planner spreadsheet program. The frequency of response for each group, for each question on the survey instrument, was computed by conducting an

analysis on each question using the VP Planner spreadsheet program. The median and mode were also computed for questions involving interval and ratio data (23). Input for the investigative questions were provided based on the ILS perception questions. A 5x7 Chi Square Contingency table using a .05 significance level, was used to determine if there is any significant difference between or within the groups concerning the perceptions of acquisition logisticians and support logisticians relative to the investigative questions. The results of this analysis are in appendix B.

A brief summary of the responses to the questions in this section is provided below. Following the written explanation is a quantitative summary showing the mode and median for each question along with the results of the Chi Square for that question.

Question number 7 through question number 9 were designed to determine the extent to which acquisition logisticians and support logisticians view the importance of the ILS elements in assessing acquisition program status. The results of these questions were nearly identical with each other. The mode and median reported for each of the questions for both support logisticians and acquisition logisticians tend to indicate that logisticians perceive the status of the integrated logistics support elements to be a major player in determining the status of an acquisition program. The results for question number 7 through question

number 9 show that 69.8% of the acquisition logisticians and 79.8% of the support logisticians agree that the ILS elements are an important part of assessing program status. Based on this premise the ILS element weights are a major factor in determining the status of an acquisition program.

Q7. The integrated logistics support elements form the major planning components of an acquisition program.

	MEDIAN	MODE	CHI SQUARE	.05 SIGNIFICANCE
ACQUISITION	5	5	17.43	36.42
SUPPORT	5	5	21.99	36.42

Q8. Integrated Logistics Support elements are used to achieve the required support capability at an affordable life cycle cost.

	MEDIAN	MODE	CHI SQUARE	.05 SIGNIFICANCE
ACQUISITION	5	5	17.42	36.42
SUPPORT	5	5	23.67	36.42

Q9. Integrated Logistics Support elements accurately reflect the status of an acquisition program.

	MEDIAN	MODE	CHI SQUARE	.05 SIGNIFICANCE
ACQUISITION	5	5	17.43	36.42
SUPPORT	5	5	21.99	36.42

Question number 10 was designed to determine the perception of logisticians concerning the rank order of the integrated logistics support elements based on the phase of the acquisition process.

The rank order of the ILS elements being phase independent was agreed to by 67.2% of the support logisticians and by 57.2% of the acquisition logisticians. Based on the weights assigned by the logisticians there is a difference of rank ordering the ILS elements in the different phases of the acquisition process. However, based on the results of the analysis of variance for question number 24 through question number 28 these differences are not significant at the .01 alpha level. Also, based on the Friedman Fr non parametric test there was no significant difference between the rank order of the ILS elements based on the phase of the program at the .01 alpha level.

Q10. The rank order of the integrated logistics support elements are phase independent.

	MEDIAN	MODE	CHI SQUARE	.05 SIGNIFICANCE
ACQUISITION	5	5	15.03	36.42
SUPPORT	5	5	23.65	36.42

Question number 11 was designed to determine the perception of logisticians concerning the rank order of the integrated logistics support elements based on the program orientation.

Both Support logisticians and acquisitions logisticians tended to moderately agree that the rank order of the ILS elements are program independent. Of the support logisticians, 59.4% agreed with this statement while 65.1% of the acquisition logisticians agreed. The median and mode reported for this question by both acquisition logisticians and support logisticians tend to indicate that logisticians perceive the rank order of the ILS elements to be program independent. Based on the weights assigned by the logisticians there is a slight difference of rank ordering the ILS elements for different programs. However, based on the analysis of variance for question number 24 through question number 28 these differences are not significant at the .01 alpha level. Also, based on the Friedman non parametric test there was no significant difference between the rank order of the ILS elements based on the phase of the program at the .01 alpha level.

Q11. The rank order of the integrated logistics support elements are program independent.

	MEDIAN	MODE	CHI SQUARE	.05 SIGNIFICANCE
ACQUISITION	5	5	17.72	36.42
SUPPORT	5	5	22.21	36.42

Question number 12 through question number 15 were designed to determine if logisticians perceive the

integrated logistics support elements to be equally weighted in the different acquisition phases. Because the answers to these questions were basically the same, they are being reported together. Based on the weights assigned by the logisticians, there is statistical evidence to indicate that the weights of the ILS elements for any of the phases of the acquisition process are not equal. The medians and modes reported for these questions by both acquisition logisticians and support logisticians also tends to indicate that logisticians perceive the ILS elements to not be weighted equally. Of the support logisticians 48.4% disagreed and 43.8% agree with this statement. This appears to be a result of the munitions and space based logisticians disagreeing while the other logisticians tended to agree. The small sample size for these two groups tends to negatively skew the data. For the acquisition logisticians, 67.4% agreed that the integrated logistics support elements should be equally weighted for all phases of the acquisition process.

Q12. The Integrated Logistics Support elements should be equally weighted in the Concept Exploration phase.

	MEDIAN	MODE	CHI SQUARE	.05 SIGNIFICANCE
ACQUISITION	3	3	15.77	36.42
SUPPORT	4	5	27.98	36.42

Q13. The Integrated Logistics Support elements should be equally weighted in the Demonstration Validation phase.

	MEDIAN	MODE	CHI SQUARE	.05 SIGNIFICANCE
ACQUISITION	3	3	15.77	36.42
SUPPORT	4	4	27.98	36.42

Q14. The Integrated Logistics Support elements should be equally weighted in the Full Scale Development phase.

	MEDIAN	MODE	CHI SQUARE	.05 SIGNIFICANCE
ACQUISITION	3	3	15.77	36.42
SUPPORT	3	3	27.98	36.42

Q15. The Integrated Logistics Support elements should be equally weighted in the Production Deployment phase.

	MEDIAN	MODE	CHI SQUARE	.05 SIGNIFICANCE
ACQUISITION	3	3	15.77	36.42
SUPPORT	3	3	27.98	36.42

Questions 16 through 18 were designed to determine to what extend logisticians view the current methods of assessing program status in terms of effectiveness. The median and mode for all of the questions for both support and acquisition logisticians tend to indicate that there is neither agreement nor disagreement with the methods used to

assess the status of acquisition programs. Of the support logisticians 40.4% indicated neither agree nor disagree. Acquisition logisticians had a response rate of 40.3% in this category with 35.7% disagreeing. There is a slight leaning toward a disagreement that the current methods are effective in measuring program status.

Q16. The current method used by AFLC to measure the status of an acquisition program is effective.

	MEDIAN	MODE	CHI SQUARE	.05 SIGNIFICANCE
ACQUISITION	4	4	16.76	36.42
SUPPORT	4	4	18.79	36.42

Q17. The current method used by AFSC to measure the status of an acquisition program is effective.

	MEDIAN	MODE	CHI SQUARE	.05 SIGNIFICANCE
ACQUISITION	4	4	18.79	36.42
SUPPORT	4	4	16.76	36.42

Q18. The current method used by AFALC to measure the status of an acquisition program is effective.

	MEDIAN	MODE	CHI SQUARE	.05 SIGNIFICANCE
ACQUISITION	4	4	18.79	36.42
SUPPORT	4	4	16.76	36.42

Early in 1988, AFSC/PL distributed a policy letter to the AFSC product division's program offices outlining guidance that should be used in assessing an individual ILS element color code. Questions 19 through 22 were designed to determine how logisticians viewed this guidance. Question number 19 tends to indicate that both support logisticians and acquisition logisticians view the current ratings as being too subjective. As a result, the responses to question number 20 through 22 indicate a strong positive agreement because of the structure that is provided. For support logisticians, 70.3% agreed that the there is too much subjectivity in the current ratings and 58.1% of the acquisition logisticians also agreed.

Q19. The current Integrated Logistics Support ratings are too subjective.

	MEDIAN	MODE	CHI SQUARE	.05 SIGNIFICANCE
ACQUISITION	5	5	13.87	36.42
SUPPORT	5	5	24.14	36.42

Q20. An ILS element with minor problems that has solutions available should be rated green.

	MEDIAN	MODE	CHI SQUARE	.05 SIGNIFICANCE
ACQUISITION	5	5	16.26	36.42
SUPPORT	5	5	18.86	36.42

Q21. An ILS element with minor to severe problems, that has potential solutions, should be rated yellow.

	MEDIAN	MODE	CHI SQUARE	.05 SIGNIFICANCE
ACQUISITION	5	5	15.26	36.42
SUPPORT	5	5	18.86	36.42

Q22. An element with serious or potentially serious problems, that require higher headquarters assistance, should be rated red.

	MEDIAN	MODE	CHI SQUARE	.05 SIGNIFICANCE
ACQUISITION	5	5	13.87	36.42
SUPPORT	5	5	24.14	36.42

Question number 23 and question number 24 were designed to determine what logisticians perceived the role of the ALMIS data base to be, as it pertained to a management information system and, as it pertained to a decision support system. The data tends to indicate that most logisticians are neither in agreement nor disagreement as to the role of the ALMIS data base being used as only a management information system or a decision support tool. The 39.6% of acquisition logisticians who agreed with these questions is offset by the 33.3% who disagreed. Support logisticians showed similar results with 21.9% agreeing and 32.8% disagreeing.

Q23. The purpose of an Logistics Management Information System is to function as a central information repository for Logistics information.

	MEDIAN	MODE	CHI SQUARE	.05 SIGNIFICANCE
ACQUISITION	4	4	20.72	36.42
SUPPORT	4	4	14.79	36.42

Q24. The purpose of a Logistics Management Information System is to function as a Decision Support System.

	MEDIAN	MODE	CHI SQUARE	.05 SIGNIFICANCE
ACQUISITION	4	4	20.72	36.42
SUPPORT	4	4	14.79	36.42

ILS Relative Value Data

The questions in the third part of the survey were designed to determine the views of logisticians on the importance of each of the Integrated Logistics Support elements, for each of the acquisition phases. They were also used to determine the relative weights for each phase of the acquisition process, for both support logisticians and acquisition logisticians. The responses of logisticians that were classified as experts were used to determine the mean weights used for the analysis of the data in this section. An expert was classified as a person who has worked a minimum of two years in the logistics field. This figure was arrived at based on results of the Deputy Program

Manager for Logistics (AFALC 001) course conducted by AFALC and based on the recommendation of the Assistant to the Commander for AFALC. For question number 25 through question number 28, the following instructions were given to the logisticians: Based on their relative importance to you, rank order and weight the Integrated Logistics Support elements, for the various phases, by distributing 100 points among each of the 10 elements. Do not equally weight them unless you believe there is no difference between them.

Question 29 was designed to determine the relative weights for each phase of the acquisition process for both support logisticians and acquisition logisticians. The following instructions were given to the logisticians: Based on their relative importance to you, rank order and weight the acquisition phases by distributing 100 points among the phases. Do not equally weight them unless you believe there is no difference between them.

For question number 25 through question number 28 the responses were input to a spreadsheet utilizing VP Planner. A mean weight for each element was computed for each group. The mean weights for the individual elements were derived by using the "AT AVG" command. The standard deviations and the variances for the different elements were computed by using the "AT STDS" and "AT VAR" commands. In order to determine if there was a difference in the weights assigned for the different ILS elements by support logisticians and acquisition logisticians, based on end item management

orientation, a 2x5 analysis of variance factorial design, at the .01 alpha level, was conducted for each of the ILS elements, in each phase, for both support logisticians and acquisition logisticians. The results of this analysis are in appendix C.

In the factorial design, acquisition logisticians for the five program management orientations were designated as Fa. Support logisticians for the five program management orientations were designated as Fb. The designation of Faxb was used to analyze the interaction between the support logisticians and the acquisition logisticians. For each of the ILS elements, in each phase of the acquisition process, the following null hypothesis was tested.

Ho: There is no difference between the weights assigned by acquisition and support logisticians, for this element, based on program orientation.

The observed F did not exceed the F .01 value for any of the elements. Therefore, we can not reject the null hypothesis of no difference between or within the groups. The results of the F tests tend to indicate there is no difference between the individual ILS elements at the .01 alpha level. The results of the Friedman Fr test tend to indicate there is no difference between the rank ordering of the ILS elements in the different phases. This result coincides with the results of question number 12 through question number 15. Appendix D summarizes the results of the analysis.

For question number 29 an analysis of variance was conducted for each phase of the acquisition process for both support logisticians and acquisition logisticians. The analysis of the data tends to indicate that the weight for the Concept Exploration phase is program dependent. The mean weight for the phase for acquisition logisticians was 24.01 with a range of 20.5 to 28.9 and 23.78 with a range of 10.56 to 35.93 for support logisticians. The analysis of variance for acquisition logisticians shows an F test value of 4.33. The analysis of variance for support logisticians shows an F test value of 7.33. These values exceed the critical value of F at the .01 significance level for Fa and Fb but not for the interaction term of Faxb. However, the large variance associated with the samples, coupled with the small sample population, tend to negatively skew the data.

For the other phases of the acquisition process the data tends to indicate that there is no difference between the mean weights based on program orientation for either support logisticians or acquisition logisticians. This data is summarized in appendix E.

Investigative Questions Summary

1. How do logisticians perceive the phases of the acquisition process should be weighted?

The results of the analysis tend to indicate that the Demonstration/Validation phase and the Full Scale Development phase are the most important followed by the

concept exploration phase. A complete result of this analysis is in appendix E.

2. How do logisticians perceive the ILS elements should be rank-ordered?

The rank order of the ILS elements in the different phases are equal. However, the individual weights are not equal. The ILS elements of design interface, maintenance planning, support equipment, and technical data are the top four ranked ILS elements in the Concept Exploration phase, Demonstration/Validation phase, and the Full Scale Development phase. However, in the Production/Deployment phase, technical data, maintenance planning, supply support, and support equipment are the top ranked ILS elements. The results of this analysis are in appendix F.

3. What is the perceived relationship between the weights for ILS elements in one phase compared to the other phases?

Based on the weights assigned by both acquisition and support logisticians there is evidence to indicate that the weights of the ILS elements for any of the phases of the acquisition process are not equal. The medians and modes reported for this question by both acquisition logisticians and support logisticians also tends to indicate that logisticians perceive the ILS elements to not be weighted equally.

4. Do acquisition logisticians perceive that the weights for the ILS elements are program independent?

To answer this question an analysis of variance was conducted for each phase of the acquisition process. The analysis of the data tends to indicate that the weight for the Concept Exploration phase is program dependent. However, the large variance, coupled with the small sample population, tended to negatively skew the data.

For the other phases of the acquisition process the data tends to indicate that there is no difference between the mean weights for the ILS elements based on program orientation. A complete result of the analysis is in appendix E.

V. Summary and Recommendations

Introduction

This chapter presents an overview and brief summary of the major findings of the study, and concludes with recommendations for further research.

Overview

Purpose of the Study. This research measured the perceptions that logisticians have of the effectiveness of the current method of evaluating logistics program status and to determine what algorithm should be used to measure the logistics status of acquisition programs. The data collected was used to determine if acquisition logisticians have a different perception of the effectiveness of the current algorithm than support logisticians and to determine the weights to be used for the ILS elements in the algorithm for the different phases of the acquisition process. The collected data was analyzed to determine any relationships between support and acquisition logisticians based on end item management orientation and the phase of the acquisition process.

Survey Summary

Using a stratified random sample based on current end item management orientation, data was collected to determine if acquisition logisticians have a different perception of the effectiveness of the current algorithm used in the ALMIS data base than support logisticians. The

data was analyzed to determine to what extent the current ALMIS algorithm is perceived to be effective in measuring logistics program status for acquisition programs and to determine what weights should be assigned to the individual ILS elements in the various phases of the system acquisition process in order to improve the algorithm.

A survey was mailed to 252 acquisition logisticians assigned to AFALC and matrixed to the Air Force Systems Command's (AFSC) product divisions or assigned to AFSC. The survey was also mailed to 120 support logisticians assigned to the AFLC Air Logistics Centers. These organizations were chosen because their item management orientation is similar to the item management orientation of the AFSC product divisions.

Summary of Findings

In developing a new algorithm it is necessary to compare the weights assigned by the logisticians in this study to the existing weights. The current algorithm assigns an equal weight to each of the ILS elements across all phases of the acquisition process. The weights are tempered somewhat by the assignment of phase weights. The current algorithm also uses a weight for the Air Force precedence code. However, this weight is more of a political influence than a major factor in assessing logistics considerations for program status. For this reason, this study did not consider the precedence score.

The factors that were considered were, (1) the weights to be assigned to the acquisition phases; (2) the weights to be assigned to the individual ILS elements; (3) the rank order of the ILS elements; and (4) the end item program orientation. There was no statistical difference between the weights assigned for the different phases of the acquisition process. This is not to imply that the phases are equal but rather that the specific program phase does not influence the status of the acquisition process. While there was no statistically significant difference for the rank order of the ILS elements there was statistical evidence to indicate that the ILS elements are not equally weighted. The observed value of Fr for this analysis is 3.36. In order for this to be significant at the .01 alpha level would require a Fr of 11.3449. The observed value of Fr does not exceed the Fr.01 value. Therefore, we can not reject the HO of no difference between the rank order of the elements. The indication from this analysis is that there is no difference between the rank order of the elements in the different phases. This, coupled with the results of the analysis of variance in appendix D, shows that because there is no difference in the weights for the ILS elements based on program orientation and phase of the acquisition process, the mean weight assigned for a given ILS element is a good indicator of the weight that should be applied in the given phase. The data shows that the status of an acquisition program can be assessed by using the following algorithm.

1. ILS Element Score. The current algorithm utilizes the following color coding for the individual ILS elements:

Green = 0

Yellow = 1 to 5

Red = 6 to 9

The weight of 20, times the color coding weight for the specific ILS element, equals the individual ILS element score. The sum of the scores equals the weight assigned for the ILS elements. It is proposed that in lieu of weighting the ILS elements by a constant weight, that they be weighted according to Table 4 based on the phase of the program.

TABLE 4

Weights for the ILS Elements

ILS ELEMENT	CE	DV	FSD	PRO
Maintenance Planning	14.91	14.74	14.02	13.02
Manpower and personnel	8.73	8.09	7.68	8.03
Supply Support	8.45	9.08	10.49	12.19
Support Equipment	10.39	10.98	11.17	11.51
Technical Data	9.03	10.57	11.94	13.04
Training and Training Support	7.19	6.73	7.46	8.63
Computer Resources Support	7.94	7.94	7.84	7.52
Facilities	8.02	8.72	8.35	8.57
Packaging, Handling, Storage, and Transportation	6.59	6.65	7.02	7.94
Design Interface	18.49	16.62	14.05	9.52

2. Air Force Precedence score. The current algorithm utilizes the following precedence score:

Precedence score = 80 divided by the Fad weight times the Urgency of Need designator weight. The precedence score serves to add little to the overall point value upon which the rank-ordering is based. It is proposed to eliminate this facet of the evaluation from the algorithm.

3. Program Phase score. The current algorithm utilizes the following weights for the different acquisition phases.

Production Deployment Phase	50
Full Scale Development Phase	25
Demonstration/Validation Phase	25
Concept Exploration Phase	10

However, the analysis of the data tends to indicate that there is no difference in the importance of the specific phase of the acquisition process. As a result it is proposed that this item be removed also.

Recommendations for Future Research

In conducting the research for this thesis and while analyzing the data, it became clear that there are several factors which future research should consider.

Life Cycle Cost. The importance of total cost analysis has been one of the key concepts identified for logistics managers. Leading authorities in the field of logistics suggest that in order to manage the logistics function of an organization in an efficient manner, it is necessary to utilize total cost analysis (13:568-571).

The ability to accurately forecast and identify life cycle costs impacts all logistics decisions. These existing cost trade-offs should be identified as soon as possible in the weapon system acquisition process to enhance the Air Force's ability to make accurate cost benefit comparisons. DODD 5000.1 requires that the costs associated with acquiring the system, ownership costs, and system readiness be balanced in terms of the mission (5:1). This directive also requires that supportability be considered while the acquisition strategy is being developed and during each of the phases of the acquisition process (2:1,7:1).

Life cycle cost management is the control of future cost impacts, performance requirements and schedule constraints in arriving at today's logistic decisions for support of the new system. As such, the issue of life cycle cost should be considered when assessing the logistics status of an acquisition program.

Regression Analysis. A regression analysis should be run on the current algorithm as well as the proposed algorithm to determine any factors or ILS elements which can be deleted. Using the acquisition program documentation maintained by AFALC/LS and historical data that is available in the ALMIS data base, the new algorithm could be analyzed to determine if it more effectively measures the status of acquisition programs.

ILS Ratings Subjectivity. The issue of the subjectivity of the color coding for the individual ILS

elements appears to be a recurring theme. An effort to remove this subjectivity was attempted by AFALC/LS with their "Questions and Answers" program. In order to develop an effective algorithm it is necessary to first develop a method of controlling the evaluator subjectivity.

Appendix A

Research Survey

FROM: LS

SUBJECT: Research Survey (USAF Survey Control Number 88-64 Expires 30 September 1988)

TO: Survey Participant

1. From a management perspective, the Integrated Logistics Support elements are used to help determine the status of an acquisition program. The purpose of this survey is to analyze the perception of the logistics community relative to this perspective.

2. As a professional in the field of logistics, your response to this survey is important to help us determine the relationship between the Integrated Logistics Support elements and the status of an acquisition program.

3. Your participation in this research is voluntary but your assistance would be greatly appreciated. If you would like a copy of the results, please send your request with your completed survey. Direct any questions you have concerning this research to Jim Miller, AFIT/LSG.

4. Please complete the attached survey and return it in the enclosed envelope by _____.

2 Atch
1. Survey
2. Return Envelope

A Perception of the Effectiveness of the Acquisition Logistics Algorithm in Measuring Program Status.

DIRECTIONS:

This survey contains three sections. Section I contains demographic questions. Section II contains questions concerning your view on the use of the Integrated Logistics Support elements for determining program status. Section III contains questions concerning your views on the importance of the individual ILS elements.

Please answer all of the questions for Section I and Section II of this survey by marking the response that best represents your view. If you do not find a response that represents your view use the one that is closes to your view. Mark your response on the attached machine-scored answer sheet using a number 2 pencil. Answer the questions for Section III directly on this survey form. This survey will take about 20 minutes to complete.

Section I

The questions in this section are to obtain information about you and your organization.

1. I am a (an)

   1. Officer
   2. Enlisted
   3. Civilian (GS)
   4. Civilian (GM)

2. My grade level is:

   1. 1-2
   2. 3-4
   3. 5-6
   4. 7-8
   5. 9-10
   6. 11-13
   7. 14-15
   8. SES

3. My duty AFSC/Series is:

   1. 66XX
   2. 64XX
   3. 346
   4. 345
   5. 20XX
   6. Other

4. The total time I have worked in logistics is:

   1. Less than 12 months
   2. 12 months to 24 months
   3. 24 to 36 months
   4. more than 36 months

5. The systems I primarily work with are:

   1. Aircraft Systems
   2. Electronic Systems
   3. Missile Systems
   4. Munition Systems
   5. Space Based Systems
   6. Other

6. My current position is:

   1. DPML/ILSM
   2. Acquisition Logistics Staff Position
   3. Support Logistics Staff Position
   4. Other

Section II

This portion of the questionnaire is to determine the degree on which you view the effectiveness of the Integrated Logistics Support elements in measuring program status. Read each item and then choose the statement which best describes your view based on the following scale.

7. Strongly Agree
6. Moderately Agree
5. Agree
4. Neither Agree Nor Disagree
3. Disagree
2. Moderately Disagree
1. Strongly Disagree

7. The integrated logistics support elements form the major planning components of an acquisition program.

8. Integrated Logistics Support elements are used to achieve the required support capability at an affordable life cycle cost.

9. Integrated Logistics Support elements accurately reflect the status of an acquisition program.

10. The rank order of the integrated logistics support elements are phase independent.

11. The rank order of the integrated logistics support elements are program independent.

12. The Integrated Logistics Support elements should be equally weighted in the Concept Exploration phase.

13. The Integrated Logistics Support elements should be equally weighted in the Demonstration Validation phase.

14. The Integrated Logistics Support elements should be equally weighted in the Full Scale Development phase.

15. The Integrated Logistics Support elements should be equally weighted in the Production Deployment phase.

16. The current method used by AFLC to measure the status of an acquisition program is effective.

17. The current method used by AFSC to measure the status of an acquisition program is effective.

18. The current method used by AFALC to measure the status of an acquisition program is effective.

Read each item and then choose the statement which best describes your view based on the following scale.

7. Strongly Agree
6. Moderately Agree
5. Agree
4. Neither Agree Nor Disagree
3. Disagree
2. Moderately Disagree
1. Strongly Disagree

19. The current Integrated Logistics Support ratings are too subjective.

20. An ILS element with minor problems that has solutions available should be rated green.

21. An ILS element with minor to severe problems, that has potential solutions, should be rated yellow.

22. An element with serious or potentially serious problems, that require higher headquarters assistance, should be rated red.

23. The purpose of an Logistics Management Information System is to function as a central information repository for Logistics information

24. The purpose of a Logistics Management Information System is to function as a Decision Support System.

Section III

The questions in this section are to determine your views on the importance of each of the Integrated Logistics Support elements for each of the acquisition phases. Mark your response on this form.

25. Based on their relative importance to you, rank order and weight the Integrated Logistics Support elements, for the Concept Exploration phase, by distributing 100 points among each of the 10 elements. **Do not equally weight them unless you believe there is no difference between them.**

1.	Maintenance Planning	_____ .
2.	Manpower and Personnel	_____ .
3.	Supply Support	_____ .
4.	Support Equipment	_____ .
5.	Technical Data	_____ .
6.	Training and Training Support	_____ .
7.	Computer Resources Support	_____ .
8.	Facilities	_____ .
9.	Packaging, Handling, Storage, and Transportation	_____ .
10.	Design Interface	_____ .
	TOTAL	100 .

26. Based on their relative importance to you, rank order and weight the Integrated Logistics Support elements, for the Demonstration/Validation phase, by distributing 100 points among each of the 10 elements. **Do not equally weight them unless you believe there is no difference between them.**

1.	Maintenance Planning	_____ .
2.	Manpower and Personnel	_____ .
3.	Supply Support	_____ .
4.	Support Equipment	_____ .
5.	Technical Data	_____ .
6.	Training and Training Support	_____ .
7.	Computer Resources Support	_____ .
8.	Facilities	_____ .
9.	Packaging, Handling, Storage, and Transportation	_____ .
10.	Design Interface	_____ .
	TOTAL	100 .

27. **Based on their relative importance to you, rank order and weight the Integrated Logistics Support elements, for the Full Scale Development phase, by distributing 100 points among each of the 10 elements. Do not equally weight them unless you believe there is no difference between them.**

1.	Maintenance Planning	_____ .
2.	Manpower and Personnel	_____ .
3.	Supply Support	_____ .
4.	Support Equipment	_____ .
5.	Technical Data	_____ .
6.	Training and Training Support	_____ .
7.	Computer Resources Support	_____ .
8.	Facilities	_____ .
9.	Packaging, Handling, Storage, and Transportation	_____ .
10.	Design Interface	_____ .
	TOTAL	100 .

28. **Based on their relative importance to you, rank order and weight the Integrated Logistics Support elements, for the Production/Deployment phase, by distributing 100 points among each of the 10 elements. Do not equally weight them unless you believe there is no difference between them.**

1.	Maintenance Planning	_____ .
2.	Manpower and Personnel	_____ .
3.	Supply Support	_____ .
4.	Support Equipment	_____ .
5.	Technical Data	_____ .
6.	Training and Training Support	_____ .
7.	Computer Resources Support	_____ .
8.	Facilities	_____ .
9.	Packaging, Handling, Storage, and Transportation	_____ .
10.	Design Interface	_____ .
	TOTAL	100 .

29. **Based on their relative importance to you, rank order and weight the acquisition phases by distributing 100 points among the phases. Do not equally weight them unless you believe there is no difference between them.**

1.	Concept Exploration	_____ .
2.	Demonstration/Validation	_____ .
3.	Full Scale Development	_____ .
4.	Production/Deployment	_____ .
	TOTAL	100 .

Thank you for your time and assistance.

Appendix B

ILS Perception Data

Q7. The integrated logistics support elements form the major planning components of an acquisition program.

Frequency of Response of Acquisition Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	3	1	11	7	17	10	11	5	5
Electronic Systems	1	0	2	3	7	8	11	5	6
Missile Systems	0	0	0	5	3	3	2	5	4
Munition Systems	0	0	3	0	5	3	1	5	5
Space Based Systems	1	0	2	0	6	2	1	5	5
Total	129								
Valid Cases	129			Missing Cases			0		

Frequency of Response of Support Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	0	1	0	4	4	5	6	6	7
Electronic Systems	0	0	1	3	6	3	3	5	5
Missile Systems	0	0	0	0	5	2	1	5	5
Munition Systems	1	0	1	1	6	0	2	5	5
Space Based Systems	0	0	0	1	3	4	0	6	6
Total	64								
Valid Cases	63			Missing Cases			1		

Frequency of Response of All Logisticians

Data Values	1	2	3	4	5	6	7	Median	Mode
	6	2	20	24	62	40	38	5	5
Valid Cases	192			Missing Cases			1		

Q8. Integrated Logistics Support elements are used to achieve the required support capability at an affordable life cycle cost.

Frequency of Response of Acquisition Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	3	1	11	7	17	10	11	5	5
Electronic Systems	1	0	2	3	7	8	11	5	6
Missile Systems	0	0	0	5	3	3	2	5	4
Munition Systems	0	0	3	0	5	3	1	5	5
Space Based Systems	1	0	2	0	6	2	1	5	5
Total	129								
Valid Cases	129			Missing Cases			0		

Frequency of Response of Support Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	0	1	0	4	4	5	6	6	7
Electronic Systems	0	0	1	3	6	3	3	5	5
Missile Systems	0	0	0	0	5	2	1	5	5
Munition Systems	1	0	1	1	7	0	2	5	5
Space Based Systems	0	0	0	1	3	4	0	6	6
Total	64								
Valid Cases	64			Missing Cases			1		

Frequency of Response of All Logisticians

Data Values	1	2	3	4	5	6	7	Median	Mode
	6	2	20	24	63	40	38	5	5
Valid Cases	193			Missing Cases			0		

Q9. Integrated Logistics Support elements accurately reflect the status of an acquisition program.

Frequency of Response of Acquisition Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	3	1	11	7	17	10	11	5	5
Electronic Systems	1	0	2	3	7	8	11	5	6
Missile Systems	0	0	0	5	3	3	2	5	4
Munition Systems	0	0	3	0	5	3	1	5	5
Space Based Systems	1	0	2	0	6	2	1	5	5
Total	129								
Valid Cases	129			Missing Cases				0	

Frequency of Response of Support Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	0	1	0	4	4	5	6	6	7
Electronic Systems	0	0	1	3	6	3	3	5	5
Missile Systems	0	0	0	0	5	2	1	5	5
Munition Systems	1	0	1	1	6	0	2	5	5
Space Based Systems	0	0	0	1	3	4	1	6	6
Total	64								
Valid Cases	64			Missing Cases			1		

Frequency of Response of All Logisticians

Data Values	1	2	3	4	5	6	7	Median	Mode
	6	2	20	24	62	40	39	5	5
Valid Cases	193			Missing Cases				0	

Q10. The rank order of the integrated logistics support elements are phase independent.

Frequency of Response of Acquisition Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	8	8	12	9	14	5	4	4	5
Electronic Systems	4	0	5	2	12	6	3	5	5
Missile Systems	2	0	3	2	4	1	1	4	5
Munition Systems	1	0	0	2	4	5	0	5	6
Space Based Systems	1	0	2	0	6	2	1	5	5
Total	129								
Valid Cases	129		Missing Cases			0			

Frequency of Response of Support Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	1	1	2	4	7	3	2	5	5
Electronic Systems	1	0	1	4	5	4	1	5	5
Missile Systems	1	1	0	1	1	1	3	5	7
Munition Systems	0	0	2	2	4	2	1	5	5
Space Based Systems	0	0	0	0	1	6	2	6	6
Total	64								
Valid Cases	64		Missing Cases			0			

Frequency of Response of All Logisticians

Data Values	1	2	3	4	5	6	7	Median	Mode
	19	10	27	26	58	35	18		
Valid Cases	193		Missing Cases			0			

Q11. The rank order of the integrated logistics support elements are program independent.

Frequency of Response of Acquisition Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	5	10	15	7	11	8	4	3	3
Electronic Systems	5	1	7	3	7	5	4	5	3/5
Missile Systems	0	0	2	4	2	2	3	5	4
Munition Systems	0	0	3	0	5	3	1	5	5
Space Based Systems	1	0	1	2	5	2	1	5	5
Total	129								
Valid Cases	129		Missing Cases				0		

Frequency of Response of Support Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	1	1	2	7	6	1	2	4	4
Electronic Systems	1	0	2	4	3	3	3	5	4
Missile Systems	0	0	1	2	2	0	3	5	7
Munition Systems	0	1	1	3	4	1	1	5	5
Space Based Systems	0	1	0	0	4	2	2	5	5
Total	64								
Valid Cases	64		Missing Cases				0		

Frequency of Response of All Logisticians

Data Values	1	2	3	4	5	6	7	Median	Mode
	13	14	34	32	49	27	24	5	5
Valid Cases	193		Missing Cases				0		

Q12. The Integrated Logistics Support elements should be equally weighted in the Concept Exploration phase.

Frequency of Response of Acquisition Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	9	6	27	7	4	3	4	3	3
Electronic Systems	6	4	13	2	5	2	0	3	3
Missile Systems	1	0	7	1	2	1	1	3	3
Munition Systems	0	2	7	1	1	0	1	3	3
Space Based Systems	2	0	3	0	1	4	2	5	6
Total	129								
Valid Cases	129		Missing Cases		0				

Frequency of Response of Support Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	5	2	3	2	7	0	1	4	5
Electronic Systems	0	1	4	0	6	2	3	5	5
Missile Systems	0	0	2	3	2	0	2	4	4
Munition Systems	2	2	4	1	2	0	0	3	3
Space Based Systems	0	2	3	1	1	1	1	3	3
Total	64								
Valid Cases	64		Missing Cases		0				

Frequency of Response of All Logisticians

Data Values	1	2	3	4	5	6	7	Median	Mode
	25	19	73	18	31	13	14	3	3
Valid Cases	193			Missing Cases		0			

Q13. The Integrated Logistics Support elements should be equally weighted in the Demonstration Validation phase.

Frequency of Response of Acquisition Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	9	6	27	7	4	3	4	3	3
Electronic Systems	6	4	13	2	5	2	0	3	3
Missile Systems	1	0	7	1	2	1	1	3	3
Munition Systems	0	2	7	1	1	0	1	3	3
Space Based Systems	2	0	3	0	1	4	2	5	6
Total	129								
Valid Cases	129		Missing Cases		0				

Frequency of Response of Support Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	5	2	3	2	7	0	1	4	5
Electronic Systems	0	1	4	0	6	2	3	5	5
Missile Systems	0	0	2	3	2	0	2	4	4
Munition Systems	2	2	4	1	2	0	0	3	3
Space Based Systems	0	2	3	1	1	1	1	3	3
Total	64								
Valid Cases	64		Missing Cases		0				

Frequency of Response of All Logisticians

Data Values	1	2	3	4	5	6	7	Median	Mode
	25	19	73	18	31	13	14	3	3
Valid Cases	193			Missing Cases		0			

Q14. The Integrated Logistics Support elements should be equally weighted in the Full Scale Development phase.

Frequency of Response of Acquisition Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	9	6	27	7	4	3	4	3	3
Electronic Systems	6	4	13	2	5	2	0	3	3
Missile Systems	1	0	7	1	2	1	1	3	3
Munition Systems	0	2	7	1	1	0	1	3	3
Space Based Systems	2	0	3	0	1	4	2	5	6
Total	129								
Valid Cases	129		Missing Cases				0		

Frequency of Response of Support Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	5	2	3	2	7	0	1	4	5
Electronic Systems	0	1	4	0	6	2	3	5	5
Missile Systems	0	0	2	3	2	0	2	4	4
Munition Systems	2	2	4	1	2	0	0	3	3
Space Based Systems	0	2	3	1	1	1	1	3	3
Total	64								
Valid Cases	64		Missing Cases				0		

Frequency of Response of All Logisticians

Data Values	1	2	3	4	5	6	7	Median	Mode
	25	19	73	18	31	13	14	3	3
Valid Cases	193			Missing Cases			0		

Q15. The Integrated Logistics Support elements should be equally weighted in the Production Deployment phase.

Frequency of Response of Acquisition Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	9	6	27	7	4	3	4	3	3
Electronic Systems	6	4	13	2	5	2	0	3	3
Missile Systems	1	0	7	1	2	1	1	3	3
Munition Systems	0	2	7	1	1	0	1	3	3
Space Based Systems	2	0	3	0	1	4	2	5	6
Total	129								
Valid Cases	129		Missing Cases				0		

Frequency of Response of Support Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	5	2	3	2	7	0	1	4	5
Electronic Systems	0	1	4	0	6	2	3	5	5
Missile Systems	0	0	2	3	2	0	2	4	4
Munition Systems	2	2	4	1	2	0	0	3	3
Space Based Systems	0	2	3	1	1	1	1	3	3
Total	64								
Valid Cases	64		Missing Cases				0		

Frequency of Response of All Logisticians

Data Values	1	2	3	4	5	6	7	Median	Mode
	25	19	73	18	31	13	14	3	3
Valid Cases	193			Missing Cases			0		

Q16. The current method used by AFLC to measure the status of an acquisition program is effective.

Frequency of Response of Acquisition Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	6	6	13	22	9	4	0	4	4
Electronic Systems	4	1	6	15	5	0	1	4	4
Missile Systems	0	0	2	5	4	1	1	4	4
Munition Systems	0	3	4	3	2	0	0	3	3
Space Based Systems	0	0	1	7	3	1	0	4	4
Total	129								
Valid Cases	129		Missing Cases		0				

Frequency of Response of Support Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	1	0	4	10	4	1	0	4	4
Electronic Systems	1	1	3	5	4	2	0	4	4
Missile Systems	0	1	2	1	3	0	1	4	5
Munition Systems	0	0	4	5	1	1	0	4	4
Space Based Systems	1	1	2	3	1	1	0	4	4
Total	64								
Valid Cases	64		Missing Cases		0				

Frequency of Response of All Logisticians

Data Values	1	2	3	4	5	6	7	Median	Mode
	13	13	41	78	36	12	3	4	4
Valid Cases	193		Missing Cases		0				

Q17. The current method used by AFSC to measure the status of an acquisition program is effective.

Frequency of Response of Acquisition Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	6	6	13	22	9	4	0	4	4
Electronic Systems	4	1	6	15	5	0	1	4	4
Missile Systems	0	0	2	5	4	1	1	4	4
Munition Systems	0	3	4	3	2	0	0	3	3
Space Based Systems	0	0	1	7	3	1	0	4	4
Total	129								
Valid Cases	129		Missing Cases		0				

Frequency of Response of Support Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	1	0	4	10	4	1	0	4	4
Electronic Systems	1	1	3	5	4	2	0	4	4
Missile Systems	0	1	2	1	3	0	1	4	5
Munition Systems	0	0	4	5	1	1	0	4	4
Space Based Systems	1	1	2	3	1	1	0	4	4
Total	64								
Valid Cases	64		Missing Cases		0				

Frequency of Response of All Logisticians

Data Values	1	2	3	4	5	6	7	Median	Mode
	13	13	41	78	36	12	3	4	4
Valid Cases	193		Missing Cases		0				

Q18. The current method used by AFALC to measure the status of an acquisition program is effective.

Frequency of Response of Acquisition Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	6	6	13	22	9	4	0	4	4
Electronic Systems	4	1	6	15	5	0	1	4	4
Missile Systems	0	0	2	5	4	1	1	4	4
Munition Systems	0	3	4	3	2	0	0	3	3
Space Based Systems	0	0	1	7	3	1	0	4	4
Total	129								
Valid Cases	129		Missing Cases		0				

Frequency of Response of Support Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	1	0	4	10	4	1	0	4	4
Electronic Systems	1	1	3	5	4	2	0	4	4
Missile Systems	0	1	2	1	3	0	1	4	5
Munition Systems	0	0	4	5	1	1	0	4	4
Space Based Systems	1	1	2	3	1	1	0	4	4
Total	64								
Valid Cases	64		Missing Cases		0				

Frequency of Response of All Logisticians

Data Values	1	2	3	4	5	6	7	Median	Mode
	13	13	41	78	36	12	3	4	4
Valid Cases	193		Missing Cases		0				

Q19. The current Integrated Logistics Support ratings are too subjective.

Frequency of Response of Acquisition Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	0	4	13	14	15	9	5	5	5
Electronic Systems	1	1	6	5	12	4	3	5	5
Missile Systems	1	0	1	3	6	0	2	5	5
Munition Systems	0	0	2	1	2	5	2	6	6
Space Based Systems	0	0	0	2	5	3	2	5	5
Total	129								
Valid Cases	129		Missing Cases		0				

Frequency of Response of Support Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	0	0	2	4	7	2	5	5	5
Electronic Systems	0	1	1	3	6	4	1	5	5
Missile Systems	0	0	0	3	1	2	2	5	4
Munition Systems	0	0	1	3	3	4	0	5	6
Space Based Systems	0	0	0	1	4	2	2	5	5
Total	64								
Valid Cases	64		Missing Cases		0				

Frequency of Response of All Logisticians

Data Values	1	2	3	4	5	6	7	Median	Mode
	2	6	26	39	61	35	24	5	5
Valid Cases	193			Missing Cases		0			

Q20. An ILS element with minor problems that has solutions available should be rated green.

Frequency of Response of Acquisition Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	2	4	7	5	29	11	2	5	5
Electronic Systems	3	1	3	5	12	6	2	5	5
Missile Systems	0	0	1	3	7	2	0	5	5
Munition Systems	1	1	2	3	2	2	1	4	4
Space Based Systems	0	0	3	2	4	2	1	5	5
Total	129								
Valid Cases	129		Missing Cases		0				

Frequency of Response of Support Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	1	0	2	3	10	3	1	5	5
Electronic Systems	1	0	2	1	8	4	0	5	5
Missile Systems	0	0	1	2	3	1	1	5	5
Munition Systems	0	0	1	4	2	3	1	5	4
Space Based Systems	0	0	1	2	4	2	0	5	5
Total	64								
Valid Cases	64		Missing Cases		0				

Frequency of Response of All Logisticians

Data Values	1	2	3	4	5	6	7	Median	Mode
	8	6	23	30	81	36	9	5	5
Valid Cases	193		Missing Cases		0				

Q21. An ILS element with minor to severe problems, that has potential solutions, should be rated yellow.

Frequency of Response of Acquisition Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	2	4	7	5	29	11	2	5	5
Electronic Systems	3	1	3	5	12	6	2	5	5
Missile Systems	0	0	1	3	7	2	0	5	5
Munition Systems	1	1	2	3	2	2	1	4	4
Space Based Systems	0	0	3	2	4	2	1	5	5
Total	129								
Valid Cases	129		Missing Cases			0			

Frequency of Response of Support Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	1	0	2	3	10	3	1	5	5
Electronic Systems	1	0	2	1	8	4	0	5	5
Missile Systems	0	0	1	2	3	1	1	5	5
Munition Systems	0	0	1	4	2	3	1	5	4
Space Based Systems	0	0	1	2	4	2	0	5	5
Total	64								
Valid Cases	64		Missing Cases			0			

Frequency of Response of All Logisticians

Data Values	1	2	3	4	5	6	7	Median	Mode
	8	6	23	30	81	36	9	5	5
Valid Cases	193		Missing Cases			0			

Q22. An element with serious or potentially serious problems, that require higher headquarters assistance, should be rated red.

Frequency of Response of Acquisition Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	2	4	7	5	29	11	2	5	5
Electronic Systems	3	1	3	5	12	6	2	5	5
Missile Systems	0	0	1	3	7	2	0	5	5
Munition Systems	1	1	2	3	2	2	1	4	4
Space Based Systems	0	0	3	2	4	2	1	5	5
Total	129								
Valid Cases	129		Missing Cases		0				

Frequency of Response of Support Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	1	0	2	3	10	3	1	5	5
Electronic Systems	1	0	2	1	8	4	0	5	5
Missile Systems	0	0	1	2	3	1	1	5	5
Munition Systems	0	0	1	4	2	3	1	5	4
Space Based Systems	0	0	1	2	4	2	0	5	5
Total	64								
Valid Cases	64		Missing Cases		0				

Frequency of Response of All Logisticians

Data Values	1	2	3	4	5	6	7	Median	Mode
	8	6	23	30	81	36	9	5	5
Valid Cases	193		Missing Cases		0				

Q23. The purpose of an Logistics Management Information System is to function as a central information repository for Logistics information

Frequency of Response of Acquisition Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	7	5	10	12	18	3	5	4	5
Electronic Systems	3	1	5	10	8	4	1	4	4
Missile Systems	0	1	3	5	2	0	2	4	4
Munition Systems	2	1	3	4	1	0	1	4	4
Space Based Systems	1	2	0	4	2	2	1	4	4
Total	129								
Valid Cases	129		Missing Cases		0				

Frequency of Response of Support Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	2	0	0	12	4	0	2	4	4
Electronic Systems	0	1	3	4	6	1	1	5	5
Missile Systems	1	1	1	3	0	0	2	4	4
Munition Systems	0	1	2	5	3	0	0	4	4
Space Based Systems	0	0	2	5	2	0	0	4	4
Total	64								
Valid Cases	64		Missing Cases		0				

Frequency of Response of All Logisticians

Data Values	1	2	3	4	5	6	7	Median	Mode
	16	13	29	64	46	10	15	4	4
Valid Cases	193		Missing Cases		0				

Q24. The purpose of a Logistics Management Information System is to function as a Decision Support System.

Frequency of Response of Acquisition Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	7	5	10	12	18	3	5	4	5
Electronic Systems	3	1	5	10	8	4	1	4	4
Missile Systems	0	1	3	5	2	0	2	4	4
Munition Systems	2	1	3	4	1	0	1	4	4
Space Based Systems	1	2	0	4	2	2	1	4	4
Total	129								
Valid Cases	129		Missing Cases		0				

Frequency of Response of Support Logisticians

Program Orientation	1	2	3	4	5	6	7	Median	Mode
Aircraft Systems	2	0	0	12	4	0	2	4	4
Electronic Systems	0	1	3	4	6	1	1	5	5
Missile Systems	1	1	1	3	0	0	2	4	4
Munition Systems	0	1	2	5	3	0	0	4	4
Space Based Systems	0	0	2	5	2	0	0	4	4
Total	64								
Valid Cases	64		Missing Cases		0				

Frequency of Response of All Logisticians

Data Values	1	2	3	4	5	6	7	Median	Mode
	16	13	29	64	46	10	15	4	4
Valid Cases	193		Missing Cases		0				

Appendix C

ILS Weights by Phase and Program Orientation

In this appendix the following abbreviations are used:

MP	Maintenance Planning
MPP	Manpower and Personnel
SS	Supply Support
SE	Support Equipment
TD	Technical Data
TTS	Training and Training Support
CRS	Computer Resources Support
FAC	Facilities
PHST	Packaging, Handling, Storage, and Transportation
DI	Design Interface
CE	Concept Exploration Phase
DV	Demonstration/Validation Phase
FSD	Full Scale Development Phase
PRO	Production/Deployment Phase

ILS Weights by Phase for Aircraft Logisticians

ILS ELEMENT	ACQUISITION CE	DV	FSD	PRO	SUPPORT CE	DV	FSD	PRO
MP	18.66	15.97	12.11	8.84	15.33	15.47	14.47	14.60
MPP	9.82	9.21	8.74	9.53	8.53	8.67	8.67	9.47
SS	7.71	8.63	10.32	12.82	7.80	8.47	8.67	10.20
SE	10.42	10.63	12.45	12.21	8.87	10.40	9.87	12.53
TD	7.32	9.00	10.74	13.24	8.67	10.00	10.67	10.67
TTS	5.61	6.08	8.13	8.39	9.00	7.00	7.13	7.47
CRS	7.98	8.50	8.92	9.18	7.87	9.35	8.80	7.53
FAC	6.34	7.61	7.95	7.84	7.27	8.60	8.20	9.47
PHST	4.26	5.45	6.82	7.74	6.46	6.13	5.73	7.40
DI	22.37	18.03	14.11	9.95	20.47	17.00	17.80	10.67

ILS Weights by Phase for Electronic Systems Logisticians

ILS ELEMENT	ACQUISITION CE	DV	FSD	PRO	SUPPORT CE	DV	FSD	PRO
MP	15.29	14.43	13.43	14.64	11.15	12.31	15.00	16.92
MPP	7.14	6.21	7.86	7.07	8.46	7.31	6.15	5.39
SS	7.21	7.00	11.86	13.57	10.00	11.15	11.54	12.31
SE	10.86	10.64	10.93	10.36	11.92	13.08	12.69	13.46
TD	9.93	10.93	12.28	10.43	9.62	11.15	11.92	12.69
TTS	.5.64	6.86	8.36	8.93	8.46	6.92	6.15	5.39
CRS	8.07	8.50	9.43	7.36	8.46	7.69	7.31	6.54
FAC	10.07	8.36	7.79	8.43	8.46	7.69	7.69	8.46
PHST	5.57	6.00	6.14	8.07	8.46	7.69	6.92	6.15
DI	20.21	20.36	11.93	11.14	14.23	15.00	14.63	12.69

ILS Weights by Phase for Missile Systems Logisticians

ILS ELEMENT	ACQUISITION CE	DV	FSD	PRO	SUPPORT CE	DV	FSD	PRO
MP	13.00	13.50	13.90	11.00	11.43	12.86	12.14	9.86
MPP	11.20	9.00	7.40	7.00	8.57	7.86	7.86	8.71
SS	7.50	8.00	11.90	14.00	7.86	9.29	8.57	10.71
SE	8.50	8.50	8.90	10.00	10.00	12.14	10.71	12.14
TD	8.50	11.00	11.90	14.00	10.71	11.43	10.71	13.57
TTS	9.30	7.00	7.90	8.00	7.86	7.14	8.57	7.86
CRS	7.50	5.00	5.40	6.50	8.57	8.57	9.29	6.43
FAC	9.50	11.50	9.90	10.00	10.71	9.29	9.29	9.29
PHST	7.50	8.00	8.40	9.50	8.57	7.43	8.58	8.57
DI	17.50	18.50	14.40	10.00	15.71	14.00	14.29	12.86

ILS Weights by Phase for Munitions Systems Logisticians

ILS ELEMENT	ACQUISITION CE	DV	FSD	PRO	SUPPORT CE	DV	FSD	PRO
MP	11.11	10.56	12.22	9.11	18.33	21.67	21.67	25.83
MPP	8.33	7.78	7.78	8.56	8.33	5.83	5.00	5.00
SS	10.00	10.56	11.11	11.67	10.83	11.67	11.67	10.83
SE	12.78	12.78	11.67	12.22	8.33	9.17	8.33	6.67
TD	8.89	10.56	13.33	12.78	12.50	13.33	15.00	16.67
TTS	6.11	7.22	8.33	10.56	8.33	6.67	5.00	5.83
CRS	8.33	7.78	6.67	7.67	7.50	5.83	5.00	5.00
FAC	6.67	12.78	8.89	10.22	6.67	7.50	7.50	8.33
PHST	5.56	6.11	7.00	9.11	7.50	5.83	5.83	5.83
DI	22.22	18.33	13.00	8.11	11.67	12.50	15.00	10.00

ILS Weights by Phase for Spaced Based Systems Logisticians

ILS	ACQUISITION				SUPPORT			
ELEMENT	CE	DV	FSD	PRO	CE	DV	FSD	PRO
MP	10.56	14.44	15.56	16.11	13.50	15.70	19.33	21.00
MPP	10.00	8.00	6.67	6.78	8.17	7.33	5.67	5.67
SS	8.56	8.33	7.78	10.56	11.67	11.67	12.50	12.50
SE	9.67	11.11	11.67	11.67	11.67	12.50	9.17	8.33
TD	12.00	14.44	13.89	15.56	8.67	9.50	15.33	15.33
TTS	8.11	7.00	5.56	6.22	8.33	7.50	6.67	5.83
CRS	8.33	7.78	6.67	6.89	7.33	6.50	4.83	5.67
FAC	11.11	8.89	10.00	9.11	8.67	8.67	7.83	5.33
PHST	9.44	7.78	7.78	7.44	12.33	11.50	9.83	11.50
DI	12.22	12.22	13.33	9.67	9.67	9.67	8.83	8.83

APPENDIX D

Relative Importance of the ILS Elements in the Acquisition Phases

In this appendix the following abbreviations are used:

MP	Maintenance Planning
MPP	Manpower and Personnel
SS	Supply Support
SE	Support Equipment
TD	Technical Data
TTS	Training and Training Support
CRS	Computer Resources Support
FAC	Facilities
PHST	Packaging, Handling, Storage, and Transportation
DI	Design Interface
Fa	Designates the acquisition logisticians for the five program management orientations.
Fb	Designates the support logisticians for the five program management orientations.
Faxb	Designates the interaction between the support logisticians and the acquisition logisticians.
F Obs	The observed value of the F test.
F .01	The critical value of F at the .01 alpha level.

Results of the Analysis of Variance in the Concept Exploration Phase

ILS ELEMENT		F Obs	F.01		F Obs	F.01		F Obs	F.01
MP	Fa	3.26	3.48	Fb	.44	3.48	Faxb	.39	1.89
MPP	Fa	.97	3.48	Fb	.09	3.48	Faxb	.18	1.89
SS	Fa	1.38	3.48	Fb	.62	3.48	Faxb	.11	1.89
SE	Fa	.61	3.48	Fb	.09	3.48	Faxb	.28	1.89
TD	Fa	1.62	3.48	Fb	.33	3.48	Faxb	.21	1.89
TTS	Fa	.98	3.48	Fb	1.68	3.48	Faxb	.24	1.89
CRS	Fa	.05	3.48	Fb	.01	3.48	Faxb	.03	1.89
FAC	Fa	2.78	3.48	Fb	.02	3.48	Faxb	.12	1.89
PHST	Fa	3.37	3.48	Fb	2.38	3.48	Faxb	.01	1.89
DI	Fa	2.55	3.48	Fb	1.22	3.48	Faxb	.03	1.89

Results of the Analysis of Variance in the Demonstration/Validation Phase

ILS ELEMENT		F Obs	F.01		F Obs	F.01		F Obs	F.01
MP	Fa	.69	3.48	Fb	.02	3.48	Faxb	.55	1.89
MPP	Fa	1.96	3.48	Fb	.25	3.48	Faxb	.07	1.89
SS	Fa	1.01	3.48	Fb	1.10	3.48	Faxb	.26	1.89
SE	Fa	.54	3.48	Fb	.21	3.48	Faxb	.32	1.89
TD	Fa	1.63	3.48	Fb	.08	3.48	Faxb	.28	1.89
TTS	Fa	.26	3.48	Fb	.11	3.48	Faxb	.02	1.89
CRS	Fa	1.06	3.48	Fb	.01	3.48	Faxb	.24	1.89
FAC	Fa	1.40	3.48	Fb	.10	3.48	Faxb	.26	1.89
PHST	Fa	2.87	3.48	Fb	.67	3.48	Faxb	.17	1.89
DI	Fa	1.40	3.48	Fb	.86	3.48	Faxb	.06	1.89

Results of the Analysis of Variance in the Full Scale Development Phase

ILS ELEMENT		F Obs	F.01		F Obs	F.01		F Obs	F.01
MP	Fa	1.43	3.48	Fb	1.17	3.48	Faxb	.27	1.89
MPP	Fa	1.54	3.48	Fb	.46	3.48	Faxb	.06	1.89
SS	Fa	.77	3.48	Fb	.02	3.48	Faxb	.36	1.89
SE	Fa	.75	3.48	Fb	.32	3.48	Faxb	.32	1.89
TD	Fa	1.97	3.48	Fb	.03	3.48	Faxb	.04	1.89
TTS	Fa	1.10	3.48	Fb	.79	3.48	Faxb	.27	1.89
CRS	Fa	2.40	3.48	Fb	.14	3.48	Faxb	.34	1.89
FAC	Fa	.81	3.48	Fb	.08	3.48	Faxb	.08	1.89
PHST	Fa	1.47	3.48	Fb	.01	3.48	Faxb	.14	1.89
DI	Fa	.58	3.48	Fb	.17	3.48	Faxb	.18	1.89

Results of the Analysis of Variance in the Production Deployment Phase

ILS ELEMENT		F Obs	F.01		F Obs	F.01		F Obs	F.01
MP	Fa	3.40	3.48	Fb	2.79	3.48	Faxb	.48	1.89
MPP	Fa	2.77	3.48	Fb	.25	3.48	Faxb	.27	1.89
SS	Fa	.24	3.48	Fb	.36	3.48	Faxb	.11	1.89
SE	Fa	.93	3.48	Fb	.01	3.48	Faxb	.56	1.89
TD	Fa	1.44	3.48	Fb	.01	3.48	Faxb	.29	1.89
TTS	Fa	3.30	3.48	Fb	2.40	3.48	Faxb	.01	1.89
CRS	Fa	1.05	3.48	Fb	.21	3.48	Faxb	.17	1.89
FAC	Fa	.67	3.48	Fb	.01	3.48	Faxb	.30	1.89
PHST	Fa	.80	3.48	Fb	.13	3.48	Faxb	.32	1.89
DI	Fa	1.14	3.48	Fb	.63	3.48	Faxb	.11	1.89

Appendix E

Relative Importance of the Phases to the Acquisition Process

Concept Exploration Phase

Mean Weights Assigned By Logisticians

Program Orientation	Acquisition	Support
Aircraft Systems	22.21	23.93
Electronic Systems	26.07	20.38
Missile Systems	20.50	22.86
Munition Systems	28.89	15.83
Space Based Systems	19.44	21.67
Total	24.01	23.78

HO: There is no difference between weights assigned by Acquisition Logisticians and Support Logisticians based on program orientation.

	F OBs	F.01
Fa	4.33	3.48
Fb	7.73	3.48
Faxb	1.06	1.89

The observed value of F exceeds the F.01 value for Fa and Fb. Therefore, we can reject the HO of no difference between the weights based on program orientation.
The difference in these means appears to be due to the small size of the sample for three of the groups.

Demonstration/Validation Phase

Mean Weights Assigned By Logisticians

Program Orientation	Acquisition	Support
Aircraft Systems	29.34	28.47
Electronic Systems	31.43	24.62
Missile Systems	23.00	25.00
Munition Systems	25.56	24.17
Space Based Systems	22.78	25.00
Total	27.75	25.89

HO: There is no difference between weights assigned by Acquisition Logisticians and Support Logisticians based on program orientation.

	F OBs	F.01
Fa	3.27	3.48
Fb	.50	3.48
Faxb	.32	1.89

The observed value of F does not exceed the F.01 value for any of the F values. Therefore, we can not reject the HO of no difference between the weights.

Full Scale Development Phase

Mean Weights Assigned By Logisticians

Program Orientation	Acquisition	Support
Aircraft Systems	28.50	26.13
Electronic Systems	25.36	28.85
Missile Systems	33.50	27.14
Munition Systems	25.00	28.33
Space Based Systems	28.33	25.00
Total	28.16	27.17

HO: There is no difference between weights assigned by Acquisition Logisticians and Support Logisticians based on program orientation.

	F OBs	F.01
Fa	3.27	3.48
Fb	.10	3.48
Faxb	.30	1.89

The observed value of F does not exceed the F.01 value for any of the F values. Therefore, we can not reject the HO of no difference between the weights.

Production/Deployment Phase

Mean Weights Assigned By Logisticians

Program Orientation	Acquisition	Support
Aircraft Systems	19.89	21.47
Electronic Systems	17.14	26.15
Missile Systems	23.00	25.00
Munition Systems	20.56	31.67
Space Based Systems	29.44	28.33
Total	20.95	25.47

HO: There is no difference between weights assigned by Acquisition Logisticians and Support Logisticians based on program orientation.

	F OBs	F.01
Fa	2.79	3.48
Fb	1.63	3.48
Faxb	.29	1.89

The observed value of F does not exceed the F.01 value for any of the F values. Therefore, we can not reject the HO of no difference between the weights.

Appendix F

Rank-Order of the ILS Elements

Acquisition Logisticians

ILS ELEMENT	CE	DV	FSD	PRO
Maintenance Planning	16.21	14.62	12.96	10.98
Manpower and Personnel	8.90	8.36	8.08	8.36
Supply Support	7.95	8.45	10.59	12.71
Support Equipment	10.44	10.66	11.56	11.55
Technical Data	8.63	10.38	11.80	13.05
Training and Training Support	6.41	6.56	7.88	9.86
Computer Resources Support	7.89	7.90	8.06	8.10
Facilities	7.90	8.95	8.50	8.63
Packaging, Handling, Storage, and Transportation	5.63	6.20	7.03	8.16
Design Interface	20.23	17.87	13.55	8.50
	Fr obs = 1.32			
	Fr .01 = 11.3449			

HO: There is no difference between the rank order of the ILS elements based on program phase.

The observed value of Fr does not exceed the Fr.01 value. Therefore, we can not reject the HO of no difference between the rank order of the elements.

Rank-Order of the ILS Elements

Support Logisticians

ILS ELEMENT	CE	DV	FSD	PRO
Maintenance Planning	12.92	14.96	15.81	16.49
Manpower and Personnel	8.45	7.64	7.00	7.47
Supply Support	9.29	10.15	10.32	11.23
Support Equipment	10.17	11.51	10.49	11.45
Technical Data	9.72	10.89	12.17	13.02
Training and Training Support	8.51	7.02	6.74	6.53
Computer Resources Support	8.02	8.01	7.47	6.53
Facilities	8.21	8.32	8.09	8.49
Packaging, Handling, Storage, and Transportation	8.21	7.40	7.02	7.55
Design Interface	15.53	14.49	14.89	11.23
	Fr obs = 2.28			
	Fr .01 = 11.3449			

HO: There is no difference between the rank order of the ILS elements based on program phase.

The observed value of Fr does not exceed the Fr.01 value. Therefore, we can not reject the HO of no difference between the rank order of the elements.

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VITA

Mr James R Miller [redacted] He received his first Bachelor of Science degree from Weber State College in 1974 and his second Bachelor of Science degree in 1976. In 1978 he received a Master of Education degree from Brigham Young University. In July 1980 he was hired by the Air Force Acquisition Logistics Division as a management intern. While in this capacity he worked in the areas of long range planning, contracting, and material management. At the conclusion of his training he was assigned to AFALC as a logistics management specialist and tasked with developing an information resource management program for AFALC. In November 1985 he became the course director for the Deputy Program Manager for Logistics course where he remained until he entered the School of Systems and Logistics, Air Force Institute of Technology, in June 1987.

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School of Systems and Logistics
Air Force Institute of Technology (AU)
Wright-Patterson AFB OH 45433

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22a. NAME OF RESPONSIBLE INDIVIDUAL Patrick M. Bresnahan	22b. TELEPHONE (*Include Area Code*) (513) 255-5023 / 22c. OFFICE SYMBOL AFIT/LSM

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ABSTRACT

This study analyzed the perceptions that AFLC and AFSC logisticians have of the current algoritm used to assess the logistics status of acquisition programs. The study also determined the weights that should be applied to the different ILS elements in order to effectively measure the logistics status of an acquisition program.

Recommendations were made to (1) change the weight assigned to the ILS elements based on program phase; (2) eliminate the Air Force Precedence score from the algorithm; (3) eliminate the program score from the algorithm.

Recommendations for future research were to (1) review the issue of life cycle cost; (2) conduct a regression analysis on the algorithm to determine its effectiveness; (3) develop a method to control the evaluator subjectivity.